

Stol et al.  
U.S. Serial N . 10/025,402  
Filed December 19, 2001

### REMARKS

Claims 4-6, 10, 21, 22, and 30-32 have been indicated as containing allowable subject matter.

Claims 1-3, 7-9, 25, 26, 28, and 29 stand rejected under 35 U.S.C. § 102(e) for anticipation by U.S. Patent No. 6,227,433 to Waldron et al. Claims 11-17 stand rejected under 35 U.S.C. § 103(a) for obviousness over the Waldron patent in view of U.S. Patent No. 6,213,379 to Takeshita et al. Claims 12, 14-17 stand rejected under 35 U.S.C. § 103(a) for obviousness over the Waldron patent in view of U.S. Patent No. 5,460,317 to Thomas et al. Claims 18-20, 23 stand rejected for obviousness over the Waldron et al. patent in view of U.S. Patent No. 6,050,474 to Aota et al. Claims 12 and 13 stand rejected for obviousness over the Waldron et al. patent in view of U.S. Patent No. 4,676,707 to Cearlock et al. Claims 24 and 27 stand rejected for obviousness over the Waldron et al. patent in view of U.S. Patent No. 6,344,117 to Enomoto et al.

Applicant respectfully traverses the prior art rejections for the following reasons.

The present invention is directed to a method of joining a pair of metal components by friction plunge riveting. According to this method, a metal rivet is plunged into a pair of overlapping metal components. **The hardness of the metal rivet is substantially similar to the hardness of at least one of the two components being joined.**

Contrary to the assertions in the Office Action, the prior art of record fails to teach or suggest this feature. The Waldron et al. does not teach or suggest the limitations of claims 1 and 29 of the hardness of the rivet being substantially similar to the hardness of at least one of the first and second components.

Quoting from the Office Action, every one of the prior art rejections is based on the following incorrect interpretation of what is taught by the Waldron patent:

The components have the same hardness (same material, same melting point) as the plug (col 3 lines 1-40).

Section 10 of the Office Action also attempts to equate "hardness" with "same material" by the direction to:

see col 2 lines 26 and 27 which teaches that the fastener can be made of the same material as the components thereby having the same hardness.

That passage actually states as follows:

The fastener may be of the same material as the workpieces, or alternatively may be made of a material having a higher melting point temperature than that of the workpieces.

This means that the fastener may have the same or higher melting point as the workpieces. Chemical composition determines melting point. Therefore, all that the Waldron patent teaches is that the fastener and workpieces may have the same or different compositions. No consideration is given to the importance of selecting the hardness of the fastener or workpieces.

As already explained on the record in the Amendment of February 28, 2003, it is improper to equate "same material" (or same melting point) with similar hardness. The hardness of a material is determined by its response to thermo-mechanical treatments. Applicants submit herewith a Declaration per 37 C.F.R. §1.132 to further demonstrate this point.

A rivet having a hardness of at least as hard as the metal components plasticizes at a rate the same as or slower than that of the metal components. The Waldron et al. patent does not appreciate the importance of hardness to plasticization of metal that occurs in the present invention. No such effect is considered in the Waldron et al. patent, therefore the method of claims 1-3, 7-9, 25, 26, 28, and 29 define over the Waldron et al. patent.

With respect to the obviousness rejections of claims 11-20, 23, 24 and 27, the secondary references do not account for the deficiencies in the Waldron et al. patent;

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namely, that the rivet has a hardness which is substantially similar to the hardness of at least one of the first and second components. Hence, claims 11-20, 23, 24 and 27 define over the Waldron et al. patent in combination with the Takeshita et al., Martin et al., Thomas et al., Colligan, Aota, Cearlock et al., or Enomoto et al. patents.

The following comments are directed to the patentability of certain of the dependent claims for additional reasons.

Claim 7 requires that the final position of the pointed rivet tip is flush with the second exposed surface. This feature is not taught or suggested by the Waldron et al. patent which only shows that the tip resides within the second component. Col. 3, lines 54-67 teaches against extending the fastener tip completely through the second component because the stated goal is to create an "undisturbed metal of the workpiece outside of the weld zone 32". The head of the fastener may be removed to be flush with the upper surface of the first workpiece, but that does not suggest alteration of the location of the rivet tip. Therefore, claim 7 further defines over the prior art of record.

Claim 8 is dependent upon claim 7 and further requires that the first and second components are held together between the clamp and a backing anvil where the backing anvil has a planar surface against which the rivet abuts to maintain the rivet tip flush with the second exposed surface. The Waldron et al. patent does show the use of a backing anvil, but it does not show that the backing anvil abuts against the rivet as it is driven into the second component to maintain the rivet tip flush with the second exposed surface. Again, the Waldron et al. patent teaches against extending the fastener tip completely through the second component, much less to abut a backing anvil against the rivet that extends through the second component. Accordingly, claim 8 further defines over the prior art of record.

Claim 13 requires that the rivet have a flange and lip which together define a recess for collecting flash between the rivet and the first exposed surface. With regard to the rejection of claim 13 based on the Waldron and the Cearlock et al. patents, the Cearlock et al. patent does not disclose a mechanism for collecting flash between the

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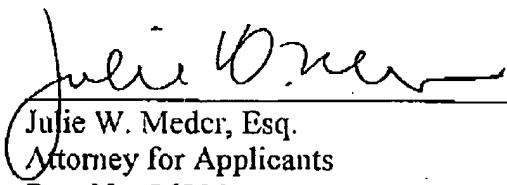
Cearlock et al. patent does not disclose a mechanism for collecting flash between the rivet and the first exposed surface. The Cearlock et al. patent shows a projection 19 on the tool 10 (not on a fastener) which rotates and removes flash. There is no recess formed by the fastener 42 that collects flash between the rivet and an exposed surface. Accordingly, claim 13 defines over the prior art of record.

Claim 19 further modifies claim 18 and requires that the third surface has a pilot hole into which the second rivet is positioned prior to plunging the rivet into the second and third components. The Office Action asserts that the combined teachings of the Waldron and Aota patents renders obvious this method. However, the Aota patent is silent on drilling a hole completely through a component prior to friction welding. Hence, claims 19 and 20 further define over the prior art of record.

In view of the foregoing, claims 1-32 are believed to define over the prior art of record and all be in condition for allowance. Reconsideration of the rejections and allowance of claims 1-32 are respectfully requested.

Respectfully submitted,



  
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